Introduction to Computer Networking (EC 441)

Homework #1

Due on Blackboard by Friday 09/16, 5PM

Solve the following exercises from Chapter 1 in the textbook (Kurose/Ross, 7th edition): P.4, P.6, P. 8, P. 13, P. 21, P. 22, P. 23, P.25, P.33.

Hint: For exercise P.8, you may want to look at the (previous edition) book's companion web site for a similar exercise (look at Interactive Exercises).
http://wps.pearsoned.com/ecs_kurose_compnetw_6/216/55463/14198700.cw/index.html
For part d. of P.8, use a computational software, such as Matlab, to compute the probability.

Additional Question 1 (from exam):
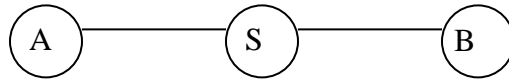
Consider the network depicted in the figure above where nodes A and B are hosts, and node S is a store-and-forward switch.
The switch has a very large buffer and never loses packets. Assume that packet overhead (headers, etc.) is negligible.

PART I:

Suppose that link $A \rightarrow S$ has a bandwidth of 1 Mb/s and propagation delay of 1 ms, and link $S \rightarrow B$ has a bandwidth of 2 Mb/s and propagation delay of 2 ms.
Suppose node A has a data message of size 10,000 bits that it wishes to transmit to node B.

1) What is the end-to-end delay if node A sends the entire message as a single packet?
2) What is the end-to-end delay if node A sends the message using 10 packets?

PART II:

Suppose now that link $A \rightarrow S$ has a bandwidth of 2 Mb/s and propagation delay of 2 ms, and link $S \rightarrow B$ has a bandwidth of 1 Mb/s and propagation delay of 1 ms. As before, assume that node A has a data message of size 10,000 bits that it wishes to transmit to node B.

Suppose node A sends the message using 4 packets.

   3) Plot the number of packets stored in switch S as a function of time (assume a packet enters the switch as soon as the first bit arrives, and leaves the switch only when the last bit is transmitted).
   4) Compute the end-to-end delay.

Additional Question 2:

Recently, a new transatlantic sub-marine cable, called Hibernia Express, has been deployed between the US and UK. Using on-line resources, answer the following questions (for each answer, please provide the URL of the source where you got the information):

   1) How much did the cable cost?
   2) How does the round trip time of Hibernia Express between New York and London compare to the round trip time of the closest competitor?
   3) How was the latency reduced?
   4) Provide two types of applications for which reducing the latency is critical.